Flight

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE AERO CLUB OF THE UNITED KINGDOM.

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THE RECEPTION OF "FLIGHT."

IF we had for a moment harboured a single doubt as to the precipitateness of our action in bringing out FLIGHT at this early stage in the growth of the aeronautic industry, all misgivings on that score would have been swept away in their entirety during the past week by the phenomenal reception that has been accorded to our first number. Congratulations and promises of hearty support have literally poured in upon us from every part of the Kingdom, and gratuitous notifications have reached us from the most unexpected quarters that steps have already been taken by numbers of enthusiasts and their friends to ensure obtaining the weekly issues with regularity. By Monday last, No. 1 was out of print at this office, thus necessitating reprinting; while, at the time of writing, orders still continue to arrive by every post which it is quite impossible to fill. At the bookstalls, too, the same apologies have had to be offered—the unanimous tale being "sold out." Needless to say, we are not only surprised at the overwhelming heartiness of this welcome, but are very gratified at the healthy prospects which are thereby opened up for the new industry and pastime in Great Britain.

A NEW YEAR'S GREETING TO "FLIGHT."

ON January 1st the first notice of FLIGHT in a public newspaper of any sort appeared in the *Morning Post*, and by way of recording this "historical" greeting we reproduce below the appreciation of our contemporary. It is but one, and may serve as an example of a large number of notices of welcome throughout the country, and to all of those who have thus signalised our advent we return many sincere thanks. It will be our endeavour to live up to the good opinions of our friends.

Thus the *Morning Post*:—

"With the new year the subject of artificial flight is to be encouraged in a practical fashion by the issue in Britain of a weekly paper from to-morrow onwards bearing the apt title FLIGHT. The journal will be published at a penny, so that it will be within the reach of all interested in the practical progress of aerial locomotion and transport, while the fact that it is to be issued from the offices of *The Automotor Journal* is a guarantee that the production will be something in every sense worthy the great movement, the current story of which it will record in words and pictures. Apart from including an excellent retrospect of the past year as well as a very full account of the Paris Aeronautical Exhibition, this week's issue of *The Automotor Journal* contains the first of a new series of full-page portraits of prominent motorists, Prince Francis of Teck, Chairman of the Royal Automobile Club, being so presented to the readers of the paper in question."

THE POSITION OF THE AERONAUTIC INDUSTRY.

IT seems almost unbelievable at the present stage in the history of aviation that the new pastime should already have an industry. But such is indeed the case; and, as we had occasion to point out last week, this fact was one of the most striking aspects of the first Paris Aeronautic Salon. There are in France to-day firms who are not merely willing to build aeroplanes, but who are manufacturing them as a staple business, and who are prepared to accept orders for them and guarantee them to fly with the same readiness that a motor manufacturer undertakes to provide a motor car. True, the experiments in flight have been going on for a long time, but it is, after all, only quite recently that any marked degree of success has been attained. Equally true is it that there are firms in England who have laid themselves out to build machines to the requirements of any experimenters; but alas for the blindness of British patronage and patriotism, customers have heretofore been far to seek.

It was not, of course, to be supposed that the French, of all people, would be blind to their opportunities in a commercial direction, but it must be confessed that there

was hardly reason to expect that nonchalant avidity with which those concerned have risen to the occasion. This attitude, too, is all the more startling, inasmuch as although flight has interested a great many people in the motor world — so that the two great movements have become very closely co-related—yet the pioneer firms in this new-born aeronautic industry can hardly be described as having been drawn from motoring ranks. One among the few names really well know to the motor world is that of Messrs. Clement, who are associated with the manufacture of cars; another is that of Messrs. Bleriot, whose lamps are known wherever motors travel by night; and a third is that of Messrs. Antoinette, who have specialised in the production of multi-cylinder "V" type engines, and whose designs are put into practice in this country by the Adams Manufacturing Co. But among the firms whose names aeronautics has brought to light is that of Messrs. Voisin, who have been responsible for the design and construction of the Farman and Delagrange machines, and who have since built one for Mr. Moore-Brabazon. They have begun well, and are, it is fair to say, quite the most successful constructors in France at the moment. Another important firm is the Etablissements R. E. Pelterie, whose present plant is already capable of building every part of an aeroplane, including the engine.

Their works were founded more than a year ago, and have now developed into quite a large factory. Among other work which they have undertaken has been the construction of the cars for the "Ville de Bordeaux" and sister airships; but their speciality is, of course, the manufacture of the R.E.P. engines, which have been designed, from A to Z, for aeroplane propulsion. Aeroplanes, as well as airships, which bear the trade mark "Astra" are made by a firm (Soc. Sourcouf) which includes Messrs. Sourcouf and Kapferer, who were at one time engineers of M. Deutsch de la Meurthe's great dirigible "La Ville de Paris." Similarly, too, an entirely new company, named the Compagnie Générale de Navigation Aérienne, has been formed to build Wright aeroplanes, and of this concern M. Michel Clemenceau, son of the well-known French Minister, is a leading spirit.

Apart from those who build complete flying machines, there are even more who build engines; but here, as is only natural, names already known in the automobile trade are more in evidence. Among them are Gobron-Brillie, Renault, Clement, Anzani, Gnome, Antoinette, Bariquand and Marre, and, last but not least, the British J.A.P. The J.A.P. firm, who have been very successful in the construction of bicycle engines, have now specialised in the manufacture of aeromotors, with the result that they have introduced two multi-cylinder models of the "V" type.

Besides the aeroplane as a whole, and the engine by which it is driven, there is the framework forming its body, and the surface material covering its wings, to give opportunities for commercial development. It is particularly interesting to find woodwork so largely employed for the former purpose, and there seems to be a large field for very extensive development in this direction along really interesting and scientific lines. Two concerns which are making a study of this work are the Soc. Construction d'Appareils Aerienne and Messrs. Letford and Niepce. The construction of wooden propellers may also be included in this particular section of the industry. They naturally form a product of the two firms we have just mentioned; but even greater prominence is given to them by Messrs. Chauviere.

With regard to the material for covering the surface of aeroplanes, that made by the Continental Tyre Co. is of course unique at the present time, and is likely to remain so for some little time to come. Those manufacturers possess extraordinary facilities for its manufacture, and have come upon the scene with years of experience behind them in the construction of similar fabric for balloons.

Needless to say, there is an all too obvious moral for Great Britain to draw from all this activity in France. As yet, only a very few individuals have conquered the air. But it is even now a foregone certainty that ere very long participation in the conquest will become quite general. When that time comes, it goes without saying that the industrial side of the movement will become of vital national importance; and the value of having been to the fore early in the day will be felt with full force in every civilised country. It is common knowledge that the United Kingdom has utterly failed to get away well at the start; but all may yet be well if the recognition of that fact is made to act as an immediate stimulant to the British nation. It is interesting to record a remark made to us by M. René Quinton—the founder of the Ligue Nationale Aerienne—during a conversation we had with him at the recent Salon, for he unhesitatingly expressed the view that England was two or three years behind already. That is, however, a Frenchman's view of the situation; and, in mitigation of its sting, we can, at least, recall the fact that even in France it is two English-speaking men who have so far led the van.

The prospects of the coming season are bright enough for England if only sufficient enthusiasm can be aroused in place of past lethargy. All being well, there should be an interesting aero show (as a section of the Heavy Vehicle Exhibition) at Olympia in March, for the secretary of the S.M.M.T. was diligently canvassing the exhibitors at the Salon to bring their machines over to this country. If he has met with any marked degree of success, that alone will give a great fillip to the movement; while, if the Society are able to obtain the co-operation of the Aero Club of the U.K., the Exhibition ought to attract the attention of Sport and Fashion to the existence of the new pastime.

England, moreover, is far from lacking firms who are ready and anxious to build aeroplanes. There is the well-known firm of Short Brothers, who are official engineers of the Aero Club, and who already have a considerable amount of construction in hand. And, amongst others, there is Mr. Howard T. Wright—a brother of Mr. Warwick Wright, the prominent motorist—who has been personally engaged in experimental work for a long time past. It only needs, in fact, more pioneer investigators like Mr. Moore-Brabazon—who will now, we trust, find sufficient encouragement to keep him at work in *this* country—and this little nucleus will receive the breath of life for which it is at present pining. There are, we know, several prominent people in this country who have already passed beyond a merely academic interest in the problem of flight; and, while we heartily wish them every personal success, we sincerely trust that they will so work that their country may even now begin to benefit from their labours. It will not be long before the Aero Club and the Aeronautical Society—not to mention the Aeroplane Club, which we even yet hope to see merged into the senior body—will have their trial-grounds ready for use; and meantime we hope all our readers are preparing the way, in accordance with their means, by giving such support as they can afford to the infant industry which is destined to revolutionise civilisation during the present century.

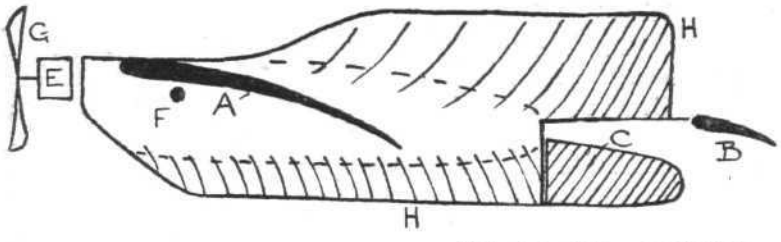
THE FIRST PARIS AERONAUTICAL SALON.

(*Continued from page* 11, *January 2nd.*)

THE following is a brief description of the various aeroplanes at the Paris Aeronautical Show :—

"R.E.P. (No. 2)."

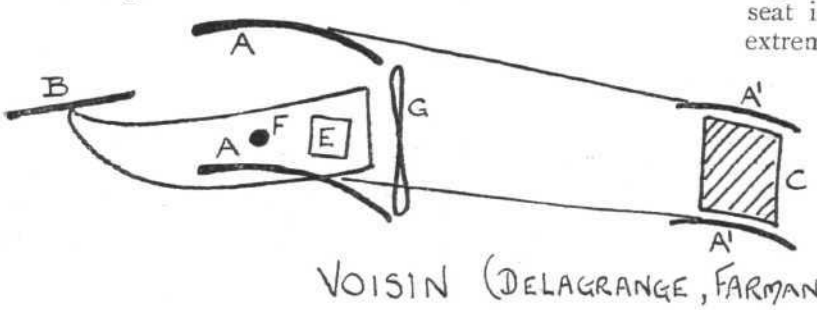
Monoplane constructed throughout at the R.E.P. works (Billancourt, Seine). The wings extend laterally from the forward end of a longitudinal steel girder of semi-circular section, and are so made and mounted that they can be warped for the purposes of steering. The girder



R.E.P. N°2BIS

has fixed keels above and below ; the latter terminates in a rudder, and behind the rudder is the elevator. In front is the engine, driving a 4-bladed tractor screw.

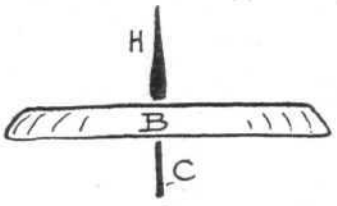
A feature of the construction is the covering of the entire machine with fabric, so as to present an unbroken surface. Also the top and bottom keels give an unusually large vertical area. Under ordinary conditions, the machine is controlled by a single pivoted lever, which operates the elevator and warps the wings. The rudder is operated by a separate lever working in a notched quadrant, and a third lever is used for setting the elevator at different normal angles.



VOISIN (DELAGRANGE, FARMAN)

"Delagrange No. 3."

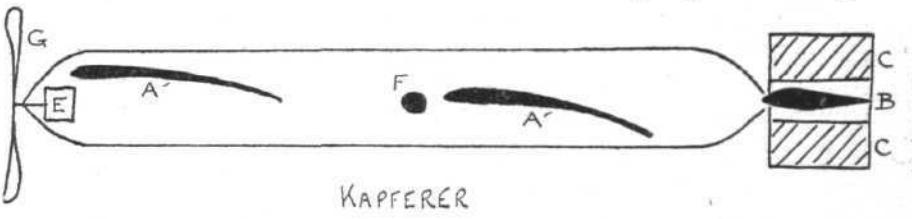
Biplane constructed by Voisin Frères, and exhibited by the Soc. d'Encouragement d'Aviation in order to advertise their new Juvisy Aerodrome, which opens on January 10th. The general lines of the machine are well known to readers of *The Automotor Journal*. It has in addition to the two main planes an elevator in front and a rudder enclosed by a box-kite tail behind. The pilot sits in the centre between the main planes, and is thus just in front of the engine — a 50-h.p. 8-cyl. Antoinette—which drives a 2-bladed propeller mounted on the end of its crank-shaft. There are two side curtains between the main planes, one near each end.



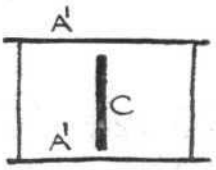
TYPE TAIL

Kapferer ("Astra").

Double monoplane built by the Soc. Sourcouf. It is a much larger machine than the majority of the single-seaters, and has a somewhat heavy appearance. The rear main plane has slightly less spread, and is slightly lower, than the front main plane ; the pilot's seat is just in front of the rear plane. At the rear extremity of the longitudinal girder is the rudder and the elevator, both members being divided to extend on each side of a central axis. The engine—a 7-cyl. 35-h.p. R.E.P.—is placed right in front and drives a 2-bladed tractor screw mounted direct on the end of the crank-shaft.



KAPFERER



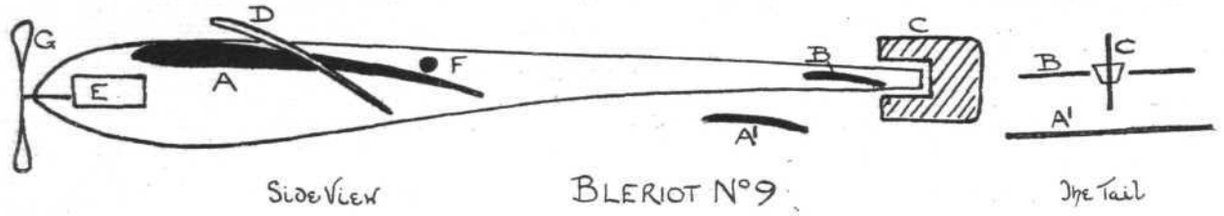
TYPE TAIL

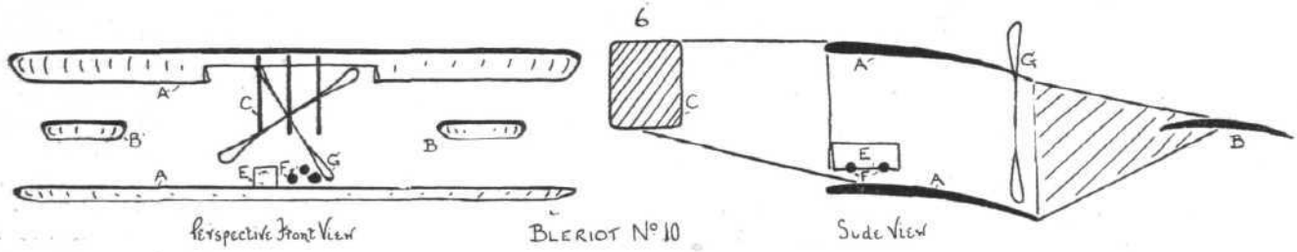
"Bleriot (No. 9)."

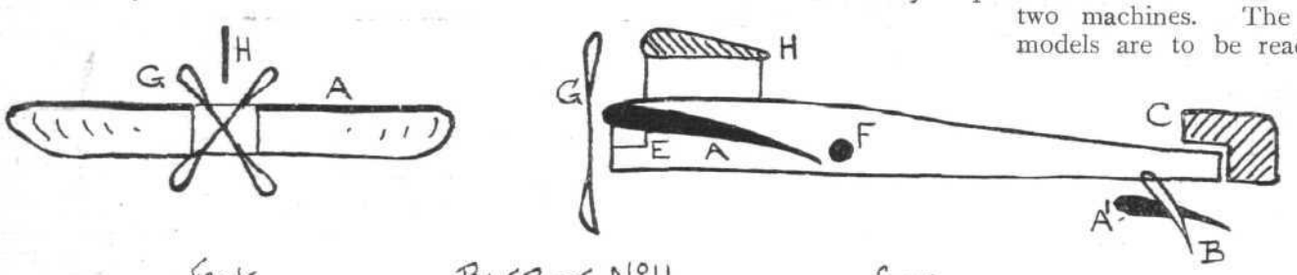
Monoplane built at the Bleriot works. It has a V-section longitudinal girder frame, part of the surface of

PARIS AERO SALON.—Side view of the Bleriot Monoplane "No. 9." The central part of the body, which is black, is the flexible radiator.

which is formed by the Bleriot flexible radiator described elsewhere. Additional radiating surfaces, constructed on the same principle, but in a different form, are arranged, Venetian-blind fashion, in front. Vellum-like paper is used as a covering surface for all the planes and the body. At the rear are the rudder and the elevator, also a small fixed horizontal plane. The tips of the main wings are pivoted for steering, in conjunction with the rudder. In front is the engine, a 50-h.p. 16-cyl. Antoinette, driving a 4-bladed flexible tractor screw mounted directly on the crank-shaft.

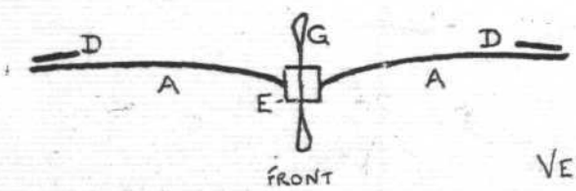






"Bleriot (No. 10)."

Biplane constructed to carry three passengers, including the pilot. It is quite the largest aeroplane in the exhibition and one of the largest in existence. The accommodation is distinctly cramped, both front seats being on the same side as the engine and occupying but little more room. The third seat, a mere box, is immediately behind, alongside the slanting chain which drives a large wooden propeller. Two flexible radiators, described elsewhere, form side curtains between the main planes, and two more side curtains are formed by the triangular frames which extend backwards to carry a pair of elevators. Part of the upper main plane is cut away to clear the propeller, and the recess has small kite-shaped baffle-curtains on either side.

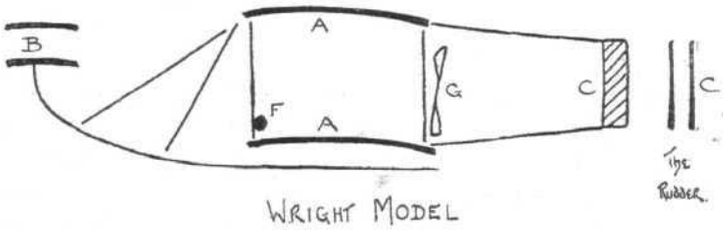


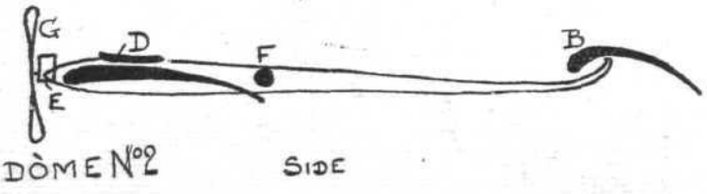
"Bleriot (No. 11)."

Monoplane having a relatively narrow spread, only 7 metres. At the rear of the longitudinal girder is a fixed plane with pivoted elevating tips, and above it is the rudder. High up, above the main wings, in the centre, is a small keel to give stability. In front is a 25-h.p. 7-cyl. R.E.P. engine, driving a 4-bladed tractor-screw fixed direct to its crank-shaft.

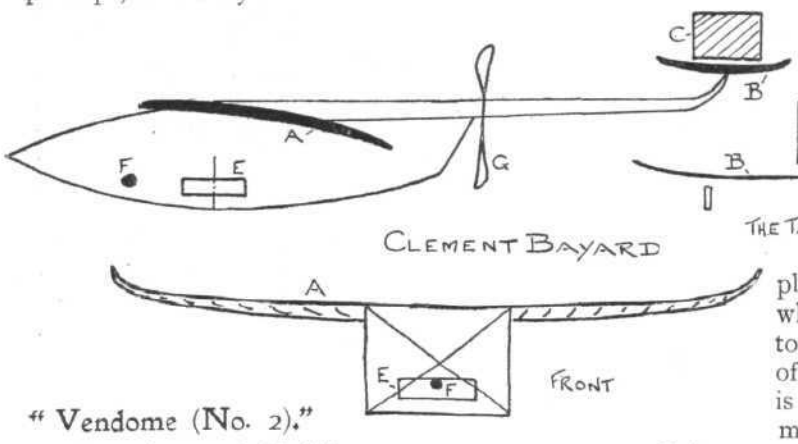
"Wright."

Full-sized model, not intended for trial purposes, constructed by Chantiers de France at Dunkirk for the Comp. Generale de Navigation Aerienne, of which M. Lazare Weiller—who bought the French patents from the Wrights—is a director. The sales are controlled by M. Michel Clemenceau—son of the well-known Minister—who states that he has already disposed of no fewer than thirty-two machines. The first models are to be ready in February, and will be tested at Cannes, where M. Clemenceau has selected his trial ground. The machines are to be fitted with 25-h.p. Wright engines, made by Messrs. Bariquand and Marre; the transmission is by chains, one crossed and the other direct, to two wooden propellers, as on Wright's own machine. The control is by two levers. One lever, that on the pilot's right, is moved sideways to steer, by the rudder and by warping the wings, while another lever to the left controls the elevator. The warping is done by diagonal wires attached to the rear corners of both main planes, and the maximum deflection is about 15 cms. Both planes





warp the same way at the same extremity of the machine, but opposite extremities move in contrary directions. The front edges of both planes are unaffected except, perhaps, indirectly.

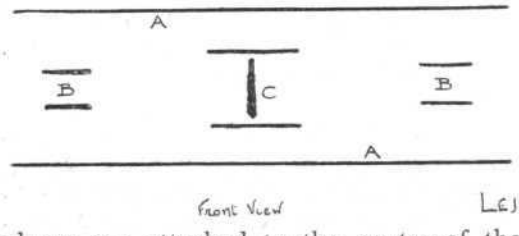


"Vendome (No. 2)."

Monoplane of birdlike appearance, constructed by M. Vendome. It is peculiar for its method of control. Two independent levers are used to warp the main wings either in the same or contrary sense, according as it is wished to ascend or steer. Quick steering is effected by pedal control of steering-tips superposed on the extremities of the main wings. At the rear is an elevator-tail set by a third lever. The tractor-screw is in front, direct-driven by a 3-cyl. Anzani engine.

"Clement-Bayard."

Monoplane designed by M. Tatin and built by M. Chauviere for Messrs. Clement-Bayard, the well-known firm of automobile engineers, who have equipped it with an entirely novel type of engine made by themselves, which was illustrated in *The Automotor Journal* of December 26th, 1908, p. 1694. It is a remarkably substantial-looking machine, and a peculiar feature of its construction is the upward curvature of the tips of the main wings. All surfaces are covered with a light-coloured varnished silk, which looks at first glance like aluminium. The pilot sits in the bows, and the planes are attached to the centre of the girder frame. Carried by long wooden beams stretching out far behind is the elevator and rudder.



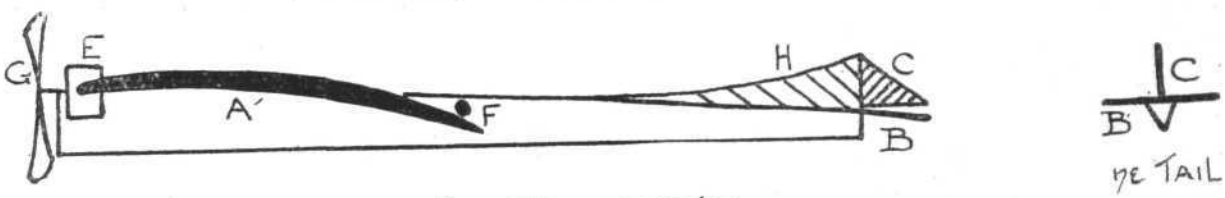
LEJEUNE N°1

"Breguet-Richet (No. 2)."

Helicopter-aeroplane, combining the principles of the lifting screw with the aeroplane pure and simple. The screws are two in number, and are placed at an angle of 40 degs. to the vertical between the front and rear biplanes.

They are driven by bevel gearing from a 50-h.p. 8-cyl. Antoinette engine placed transversely, and are stated to give a starting lift of 300 kilogs. with a horizontal pull of 250 kilogs. at 300 r.p.m. Each screw has four flexible blades, and is 4·3 metres in diameter. Of the two main planes, the biplane at the rear has a spread of 14 metres, while the monoplane in front is 10 metres across; together (and with a few other smaller planes) a total of 60 sq. metres surface is provided. The rudder is behind, and the elevator in front beneath the fixed monoplane.

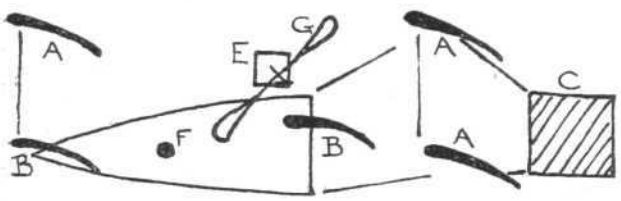
Between the main plane are two horizontal steering planes, which twist in an inverse sense, and are controlled by a pedal. The machine weighs 550 kilogs., and has been constructed at Douai by M. Breguet; its frame is made entirely of steel. It is very large, and looks cumbersome, but is not very heavy for its dimensions.



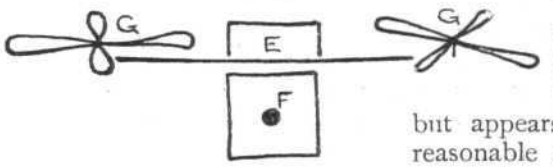
ANTOINETTE

"Voisin-Farman No. 1."

Biplane constructed by Voisin Frères on the lines of "Farman No. 1," and equipped with a dummy pilot to give reality to its setting over the grand staircase, where it looks for all the world as if about to fly off from the balusters. The general lines of this machine are the same as the "Delagrange," and it presents the same workmanlike appearance which is characterising the Voisin productions. It is neither clumsily heavy nor flimsily light, but appears to have just a reasonable degree of rigidity which does the builders credit for their judgment in design.

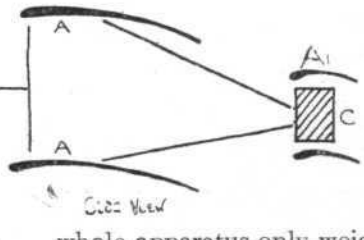


BREGUET N°2



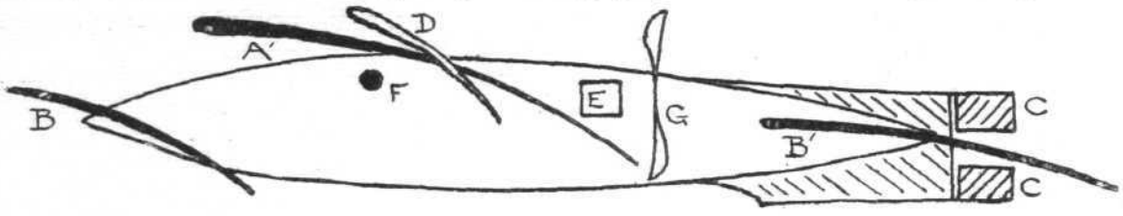
"Lejune (No. 1)."

Biplane constructed by Messrs. Pischoff and Koechlin, of Billancourt, for M. Lejune. It is a feeble looking job in bamboo and unvarnished linen, but is designed a little after the lines of the Wright machine in general appearance, although the controlling planes are quite different. There are two double elevators in front, situate some way apart, and a simple vertical rudder behind enclosed in a box-kite tail *à la Voisin*. The whole apparatus only weighs 150 kilogs., and is equipped with but a 12-h.p. 3-cyl. Buchet engine. The Wright system of chain transmission with twin propellers is used.



"Antoinette."

Monoplane built and engined by the Soc. Antoinette. It has, like the "Bleriot No. 9," a particularly light, speedy appearance, and is not unlike a huge dragon-fly when viewed from above. The long V-section girder frame, resembling a racing skiff, enhances its sporting effect, and suggests that the type might become very popular if ultimately proved to be successful. Part of the frame is filled in by the condenser-tubes belonging to the Antoinette installation, as described elsewhere. At the rear is the rudder and the elevator; both are small triangular surfaces, and the former is placed immediately above the latter. They also both form extensions of fixed triangular planes forming a cross-tail.



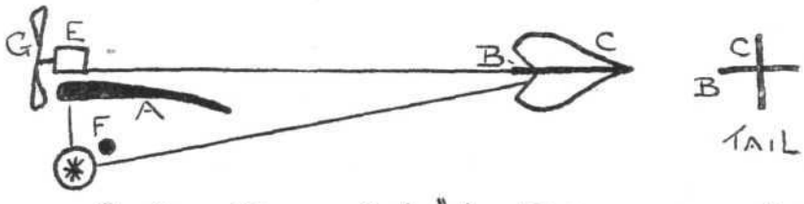
PISCHOF-KOECHLIN :- SIDE VIEW

"Pischoff-Koechlin."

Monoplane having a car built like a boat, and with the pilot's seat well forward immediately between the main wings. In front is a divided elevator, and there is another behind in addition to a divided rudder. The controlling apparatus was not assembled, nor was anyone in evidence on the stand to explain what would be employed. Immediately behind the main wings are two wooden propellers, driven by chains from a twin-cylinder (opposed) horizontal engine.

Santos Dumont's "La Demoiselle."

Besides being the smallest machine at the show, "La Demoiselle" hangs aloft by a wire like a toy butterfly so that few of the visitors noticed its existence. It is a monoplane having a twin-cylinder engine mounted above the wings. The engine drives a two-bladed tractor-screw and the aviator sits beneath on a light saddle. The spread of the wings is only about 5 metres, and their surface only about 9 sq. metres. The total weight is only 67 kilogs., so that it can be very readily handled by one man; it has already achieved some short flights.



SANTOS DUMONT'S "LA DEMOISELLE"

Table of Reference Letters for the Sketches of Aeroplanes.

A	Main wings or planes.	**D**	Steering tips.
A[1]	Tail or small supplementary fixed plane.	**E**	Engine.
		F	Pilot's seat.
B	Elevator.	**G**	Propeller or tractor-screw.
C	Rudder.	**H**	Keel.

AEROPLANE PROPELLERS.

IT is a very singular fact that a propeller is regarded by the uninitiated as the simplest possible kind of apparatus; while, by those who know or try to know the facts, it is looked upon as one of the most puzzling devices in the whole science of engineering. Its study is an education in itself, and an entertaining one to boot, for to read the innumerable different theories on the subject which have been propounded from time to time by various investigators of the laws appertaining to the propulsion of ships—for it is, of course, in marine work that the propeller has hitherto found its field of greatest utility—is often diverting, to say the very least.

Very little is known about the aerial propeller at the present day, and it is very evident that a great deal will have to be found out before the utmost capabilities of aerial engines are turned to the best advantage. It is very certain that some of the propellers on view at the Salon will not be considered as high-class examples of design and workmanship in a few years to come, but then it is also just as obvious that very serious efforts are already being made by different firms to cope with the problem in a fashion that is at once scientific and commercial. In days when it is difficult enough to get the machine as a whole to fly at all, it

TABLE OF PROPELLERS AT THE PARIS SALON.

Aeroplane.	Maker of Propeller.	Position.	Drive.	No.	Blades.	Diameter.	Pitch.	Remarks.
						m.	m.	
Aluminium Blades Mounted on Steel Tubes.								
R.E.P. (No. 2) ...	P.E.P. ...	Front	Direct	1	4	2·0	—	90 k.p.h. at 1400 r.p.m.
Bleriot (No. 9, 11)	Bleriot ...	,,	,,	1	4	2·1	1·3	Flexible.
Antoinette ...	Antoinette ...	,,	,,	1	2	2·2	1·3	
Kapferer ...	—	,,	,,	1	2	2·5	—	
Delagrange ...	Voisin... ...	Middle	,,	1	2	2·0	—	
Farman	Voisin... ...	,,	,,	1	2	—	—	
—	Soc C.A.A. ...	—	—	—	—	—	—	Soc. Constr. d'Appareils Aeriens, makers.
Wooden Propellers.								
Wright	Ch. de France	Middle	Chains	2	2	2·8	—	One chain crossed.
Bleriot (No. 10)...	Bleriot ...	,,	Chain	1	4	3·0	3·2	
Clement	Chauviere ...	,,	Bevel	1	2	2·4	2·5	Horizontal engine with vertical crank-shaft.
Vendome (No. 2)	Vendome ...	Front	Direct	1	2	2·45	2·0	Flexible.
—	Letord ..	—	—	—	—	—	—	Make any size, to order.
—	Soc. C.A.A. ...	—	—	—	—	—	—	Soc. Constr. d'Appareils Aeriens, makers.
Special Construction.								
Breguet	Breguet ...	Middle	Bevel	2	4	4·25	—	Hollow aluminium flexible blades; variable pitch.
—	Gnome ...	Front	Direct	1	4	2·0	1·5	Thin steel, flexible.

is not surprising that experimenters should seek to have a propeller on their machine which they can play about with to their heart's content, rather than one which is the last word in refinement and finish. The propeller-blade which consists of an aluminium paddle riveted to the flattened end of a steel tube, the other end of which is stuck tangentially into a suitable boss, forms an admirable device for experimental purposes, inasmuch as both the effective diameter and also the pitch can be varied at will.

The pitch, it may be remarked for the benefit of those who are interesting themselves in this subject for the first time, is the distance which the propeller theoretically advances through the air in making one complete revolution. It is, in effect, a measure of the angle at which the blades are set relatively to their plane of rotation. If they are set wholly in their plane of rotation, that is to say, at right angles to the shaft which drives them, they have no pitch at all, and consequently exert no thrust upon the machine; conversely, if the blades lie parallel with the shaft, they have an infinite pitch, but again exert no thrust, although they act very well as paddles to disturb the air. It is in this latter form that they make a very useful kind of dynamometer for absorbing the power of an engine for testing purposes. In practice, the blades of aerial propellers are generally set at such an angle that the pitch works out, roughly speaking, at a figure which is between 60 per cent. and 100 per cent. of the diameter. At the present time, however, there is very little of a decided character about the propellers in use, although it is interesting and instructive to bear in mind that in those at present employed, there is often an approximate equality between the diameter and the pitch.

In our remarks upon the construction and design of aeroplanes, we dealt with the relative positions of propellers, and pointed out certain considerations which have to be taken into account when comparing propellers which are placed behind the machine so as to push, with the screws which are placed in front so as to pull. It is, therefore, unnecessary to deal further with the subject.

Flexible Propellers.

At high speeds, a propeller, like any other rigid body revolving about an axis, possesses very considerable inertia of a peculiar kind which makes it display a marked resistance to the tilting of its axis of revolution. This resistance is termed gyroscopic force, and is only in evidence when the propeller is in motion; it increases if the speed increases, and it is more pronounced in heavy propelle s of large diameter than in those which are small and light. This gyroscopic force is so powerful that it may have a serious effect upon the control of a machine as a whole, and has even been known to snap the propeller shaft in two rather than allow the propeller to follow the pitching and tossing of an aeroplane in unsteady flight. This is naturally a serious aspect in propeller design, and the fact that many constructors of aeroplanes favour the use of a tractor-screw mounted direct on the crank-shaft to the high-speed engine has led the makers of propellers—who in many instances, of course, are the makers of the aeroplanes also—to use flexible blades. These, by springing a little when the shaft is suddenly tilted, absorb some of the gyroscopic force, and thus prevent its effect being quite so pronounced. In some cases this flexibility is carried to an extreme, as for instance in the propeller attached to the Gnome rotary engine, which has long blades made of thin sheet steel. It is particularly interesting to notice, however, that the attribute of flexibility is by no means necessarily confined to metal propellers, for there is a wooden tractor screw on the Vendome aeroplane which can be bent to quite a considerable degree without damage.

Wood *v.* Aluminium.

Aluminium, on account of its lightness, is a favourite material for the construction of propeller blades, and in most cases they are, as has been mentioned, riveted to the flattened end of a steel tube. The rib thus formed by the flattened tube on the back of the blade is probably a centre of local air disturbance, and as such may possibly be condemned in future as a source of wasted power. Experiments at all times have ever gone to show that propellers working in a fluid—and air is a fluid—are most efficient when they have smooth, even surfaces undisturbed by projections and lumps.

Wood is finding favour as a material for propellers with many experimenters, and there are some examples of very high-class work to be seen at the Salon. Properly made, a wooden propeller has a beautifully smooth polished surface, and being solid from boss to tip it is free from any joints and projections likely to waste power. In order to avoid warping, the best wooden propellers are built up out of numerous thin layers in a manner which is commonly followed by pattern makers when constructing the wooden cores from which iron castings are moulded. In the larger wooden propellers, the blade may be made hollow for the sake of lightness and flexibility, and it is thus made in the Vendome propeller. In some cases the wood is bound with fine fabric to give greater strength.

A propeller which is of an altogether uncommon description is that employed on the Breguet machine. It has hollow blades built up from strips of aluminium arranged transversely, and overlapping one another like the sections of a lobster shell. Each strip is continuous across the face and the back of the blade, and its extremities meet together to form a sharp edge. It is this edge which trails through the air as the propeller revolves, the advancing edge being quite blunt and round, as it is formed by the bend in the strip of aluminium. Between the folds of the aluminium strips, which are built up about a central steel tube, are light steel springs, and the whole construction is such that the blade is extraordinarily flexible and of a very resilient character. It is stated by the inventor of the machine that the blades have been thus designed to afford an automatically variable pitch.

In the table on page 22, details are given of the propellers mounted on some of the leading machines.

Aeroplane Engines.

IN the next and concluding instalment of our report of the Paris Salon, we shall deal with the aeroplane engines. These form, as everyone interested in flight realises, an all-important section of the industry, for to a great extent it may be said that the records which are achieved in the future by the leading aviators will in a large measure directly depend on the excellence of their motors. Already, as many of our readers know, from various descriptions which have appeared in the columns of *The Automotor Journal*, some remarkable developments have taken place in the design of motors for aeroplane work. In most cases, in fact, the types which have been developed are quite different from those in use on motor cars.

NEWS OF THE WEEK.

Wright's Final Effort for the 1908 Michelin Prize.

As we announced last week would be the case, Wilbur Wright made a further attempt on the last day of 1908 to improve upon his record for the Michelin Cup. The fact that he was very nearly frozen stiff on Wednesday, December 30th, made no difference whatever to the carrying out of his intention that he would again do his best on Thursday, December 31st. Accordingly at about a quarter past eleven he had his machine brought out of the shed and made preparations to ascend. Very soon afterwards he made a start, and everything went well for about 40 minutes or so, when he had to come down because the petrol tank was leaking

Lunch intervened, but afterwards Wright said he would make another attempt, so up in the air he rose again, nothing daunted by the Arctic cold. On and on he travelled through the air, until his record of December 18th, which stood officially at 99·8 kiloms., was broken, and still he continued until, having been aloft for 2h. 20m. 23s., and having accomplished officially 124·7 kiloms., he at last descended.

The course was the same as that employed on former occasions; that is to say, it was triangular in shape, and the total of its three sides amounted to 2·2 kiloms. The start took place at 2 p.m. exactly, and sunset, which terminated the trial as far as the Michelin Prize was concerned, was calculated to occur at 4h. 19m. 33s. p.m. allowing for the difference in longitude between Le Mans and Paris. Wright finished his 56th turn of the triangle at 4h. 19m. 6⅕s., and the sun set before another lap was accomplished. The flight by which he wins the Michelin Cup is, therefore, 123·2 kiloms. in length, and its official duration is 2h. 18m. 33⅗s. After the sun had set, Wright's flight was continued for a distance of 1·1 kiloms. on the course, and 0·4 kilom. returning to the shed, thus bringing the world's record up to 124·7 kiloms. in a duration of 2h. 20m. 23⅕s. These are, of course, the official distances and times; it goes without saying that the actual distance traversed during the flight was far greater. It is quite possible that Wright may have actually achieved a distance of 100 miles, although that is perhaps an outside estimate.

The Five Attempts.

THIS last, which was so successful, was Wright's fifth official attempt for the Michelin Cup, and it is interesting to summarise the series of results. The first important flight took place on Monday, September 21st —almost immediately after hearing of his brother's unfortunate accident—when a flight lasting 1h. 31m. 20⅘s. was accomplished, of which, however, only 52m. occurred before sunset. The record for the cup on this occasion was, therefore, a distance of 41 miles only. On September 24th, the record was slightly increased to 54m. 3⅕s. On September 28th the hour was exceeded in a flight of 1h. 7m. 24s. Two long passenger flights in connection with the Weiller contract intervened at this period, and were 1h. 4m. 26⅖s. and 1h. 9m. 45⅖s. respectively. It was not, therefore, until December 18th that a further attempt was made, and it was then that he accomplished the flight of 1h. 54m. 53⅖s., which we recorded last week. Including the attempt which was made on December 30th, which did not improve upon the record of December 18th, the trials may be said to be six in number.

The Official Report.

THE Sarthe Aero Club has sent in its official report to the Aero Club of France relating to the trial on December 31st, and the following are the leading facts which the document contains :—

The trial took place at the Auvours Camp on December 31st, 1908, under the auspices of the Aviation Committee of the Sarthe Aero Club. The track was marked out by three flags forming an isosceles triangle having two long sides of 1,000 metres each, and a base of 200 metres. The word to go was given at 2 p.m. exactly, and the aeroplane left the starting rail at 2h. 0m. 3s. Wright passed the first post, which counts as the start for the Michelin Cup, at 2h. 0m. 32⅗s. He accomplished 56 circuits, which is equal to a total length of 123·2 kiloms., in 2h. 18m. 33⅗s. duration. The last passage past the starting post before sunset took place at 4h. 19m. 6⅕s. Sunset at Paris on the date in question occurred at 4h. 11m. p.m., and an allowance of 8m. 33·26s. was made for the difference in longitude.

The signatories to the report are Messrs. Leon Bollée, Durand, Rene Pellier, L. Vernay, Veber, and Bariller.

What He Has Won.

BY his flight on Thursday, or rather by his series of flights above mentioned, for none of them have ever been beaten, Wright secures the Michelin Prize, which is undoubtedly the Blue Ribbon of aviation at the present time. He becomes the nominal holder of the trophy, which is valued at 10,000 francs, and secures 20,000 francs in cash. In addition he wins the Triaca Prize of 500 francs, which is open to members of the Aero Club of France and members of the Aero Club of America only.

M. Barthou as a Passenger.

BESIDES making two attempts for the Michelin Cup in one day, Wilbur Wright concluded his experiences in 1908 by taking up M. Barthou, Minister of Public Works, as a passenger. That official had come specially to Le Mans for the purpose of watching Wright fly, and if possible of flying with him, but it was not until twenty minutes past five that he was able to realise his desire. It was then quite dark, and Wilbur Wright and his passenger only remained in the air for about four minutes.

Wilbur Wright Gains Weight.

AFTER giving short flights to a few of his friends, Wilbur Wright, on Saturday, January 2nd, proceeded with his preparations for leaving Le Mans, including the weighing of his aeroplane and himself. The former scaled 364 kilogs., and the latter 71 kilogs., which it appears is an increase of some 8 kilogs. or so on his weight since his arrival in the Sarthe district. As Wright remarked on this occasion, "flying seems to fatten people."

Wright's Souvenir.

As a memento of his pleasant stay amongst them, the members of the Sarthe Aero Club are presenting

Wilbur Wright with a work of art in bronze by the sculptor Carvin. The subject is entitled "Muse de l'Aviation," and is symbolical of a goddess laying bare the Secrets of Flight possessed by birds. It was designed by M. Carvin, and submitted for selection as the Michelin Cup, in which, however, it was unsuccessful.

Orville Wright En Route for France.

ORVILLE WRIGHT and his sister, Katherine, sailed from America on January 5th on the "Kaiser Wilhelm der Grosse"; as quickly as possible they will join Wilbur Wright.

The Wrights' Programme.

AT the present time Wilbur Wright is awaiting the arrival of his brother in Paris, but before leaving for Pau he will return to Le Mans in order to complete the designs for the new engines which are being made for him by M. Bollée. At Pau he will remain for about a month, and will continue his lessons to his pupils, Count de Lambert, M. Paul Tissandier, and Captains Gerardville and Lovelace. Afterwards he will leave for America, there to take up the work in connection with the U.S.A. Army contract at the point where his brother was so unfortunately compelled to leave off by his accident. In the meantime Orville Wright will remain at Pau to superintend the construction of six aeroplanes which the brothers are under contract to deliver. Subsequently Wilbur Wright will return from America, and together they will embark upon still more ambitious work.

A Dutch Invitation.

LAST week it was the Italians who were anxious to get Wilbur Wright to go and see them, and now it is the Dutchmen, for it is reported that the Dutch Aeronautic Society has sent Wilbur Wright an invitation to give some performances with his machine in Holland.

Wright's New Engine.

WILBUR WRIGHT is having a new engine built for him by M. Leon Bollée, and hopes to be able to succeed in achieving much longer flights with his machine when it has been fitted, than have been found altogether feasible hitherto. He anticipates voyages—it is only fair to call them that—up to 150 miles in length, but he does not think that the generality of people will be able to do very much with the aeroplane just yet, and he also thinks that to attempt flying over houses and towns at the present time would be somewhat rash. As to his own method of descent on runners, which has been much criticised, he says that he intends continuing this practice, although he hopes to be able to discard his starting gear in the future.

Moore-Brabazon's Bad Luck.

MOORE-BRABAZON, who had also entered to compete for the Michelin Cup, had the misfortune to have his mechanic injured by an explosion of the petrol tank, and perforce had to abandon further hope for 1908—returning to Tara Hall, his Irish home, for a week's rest.

Farman Unsuccessful.

IN spite of much experimenting, Henry Farman was also unsuccessful in putting up a good flight for the Michelin Cup. He made several unimportant flights of short duration in the presence of the Committee of the Aero Club of France, but in the end he became thoroughly disheartened and took his machine back to the shed.

British Army Aeroplane.

AFTER a period of seclusion in its shed, following upon the somewhat unpleasant termination to its first trial flight, the British Army aeroplane emerged into the light again late on Wednesday afternoon in charge of Mr. S. F. Cody, under the supervision of Colonel Capper. In the interim the machine has undergone some considerable alteration, particularly in connection with the elevators and rudder.

The aeroplane is of the biplane type, and has an 8-cyl. 50-h.p. Antoinette engine installed immediately above the centre of the front edge of the lower deck. The engine drives two tractor-screws through chain-gearing. The pilot sits immediately behind the engine. Extended on an outrigger, consisting of two parallel beams, is a vertical rectangular rudder at the rear, while in front are three elevators carried by a triangular framework. The central plane, which is some 20 ft. in span, is the elevator proper; the smaller pivoted planes on either side are under separate control, and are more particularly for the purpose of maintaining stability. Behind the central elevator is a vertical plane.

No attempt was made to fly with the machine, but experiments were carried out by means of ribbons tied to the framework in order to observe the nature of the draught from the screws. A short trial run over the Farnborough Common was also made.

Mr. Howard Wright's Work.

MR. HOWARD WRIGHT'S helicopter is now completed, and has been sent out to Italy. We are informed that the tests of this flyer, carried out in England, have been eminently satisfactory. Mr. Wright is now building, for an English enthusiast, a large bi-plane, which he hopes to complete early in February. Both his workshops in High Street, Marylebone, and his larger premises at Battersea Park, are now busily employed on machines being constructed to order.

"Bleriot XI" to be Tried.

AT any moment now, the short-span Bleriot monoplane No. XI may be expected to make its trials at Issy.

Aeroplane Model Trial at Nice.

COINCIDENT with the Monaco Aeroplane Meeting, there is a scheme afoot to organise a competition for flying models at Nice. Those interested should write to M. Bonhomme, 3, Rue Pertinax, Nice.

A Giant Helicopter—the Zako.

A RUSSIAN engineer residing at Brussels, named Zakovenko, has designed a monster helicopter, which it is supposed will be able to lift about twenty passengers. Its estimated weight is 5,700 kilogs.

The American Ae.C. at the Federation.

THE Aero Club of America has nominated Mr. Roger Wallace, Chairman of the Aero Club of the United Kingdom, to be its representative at the meeting of the Federation next week in London.

The "C.A.M."

THESE are the initials under which the French Commission Aerienne Mixte will in all probability be popularly known in the future, and as this body is for all practical purposes the most important aviation committee in France, it is as well that they should be brought prominently before that section of the public which is interested.

The last meeting of the Committee took place on December 22nd and 30th under the Chairmanship of M. Loreau, when the statutes were definitely adopted. The Committee has decided that the province of aeronautic sport, so far as France is concerned, shall be divided into two sections, one relating to balloons, which will be controlled by the Sports Committee of the Aero Club of France, and the other relating to flying machines and aviation matters generally, which will be under the control of the C.A.M.

The C.A.M. itself is to be exclusively composed of delegates from the Automobile Club of France, the Aero Club of France, the Chambre Syndicale des Industries Aeronautique, and the Ligue Nationale Aerienne, each body to send five representatives. The objects of the C.A.M. are as follows:—

1. The elaboration of rules relating to flying sports.
2. The application of those rules.
3. The sanctioning of special rules.
4. Keeping a record of events.
5. Issuing licences to organising bodies and competitors.

The C.A.M. has constituted itself as a national tribunal of appeal, but recognises the International Federation, although at the present time this recognition is subject to a modification being effected in the constitution of the Federation. If these modifications are not put into effect before October 31st, the C.A.M. will continue its control, which in principle is arranged to expire at the end of this year.

The first International flight meeting at Monaco will take place under F.A.I. rules, with supplementary regulations established by the C.A.M.

Progress of Mechanical Flight.

IN the table which appeared in our issue of last week, owing to a printer's error, the flight made by Mr. Henry Farman on October 30th, was not marked as a flight across country. This, of course, was the flight from Chalons to Rheims, which will go down to history as one of the most noteworthy performances of the early days of the new movement. The table also did not make special mention of height records. At present, the record stands to the credit of Wilbur Wright, who flew at an altitude of over 100 metres when winning the second Sarthe High Flight Prize. Previous to this the only official records for height were those of Farman and Wright, both of whom secured the Aero Club of France's prize for a flight at a height of 25 metres, the former on October 31st, at Chalons, and the latter on November 18th, at Auvours, when he also secured the first Sarthe High Flight Prize.

Aeronautic Level Competition.

THE entries for the competition for level indicating devices, organised by the Aviation Committee of the Aero Club of France, closed on December 31st, 1908.

New *Daily Mail* Cross Channel Prize.

WITH the termination of 1908 the original *Daily Mail* prize of £500 for the first aeroplane to cross the Channel expired, but in their issue of January 1st this year our contemporary announces the creation of a new prize of £1,000 which has been established under the same conditions.

Seven entries in all have been received for the prize, our contemporary announces. Those who have sent in their names are as follows:—Capt. Windham, Mr. Moore-Brabazon, M. Lejeune, Prince Serge Bolotoff, MM. Pischoff and Koechlin, Messrs. Voisin, and Messrs. Antoinette.

New Prix de la Commission.

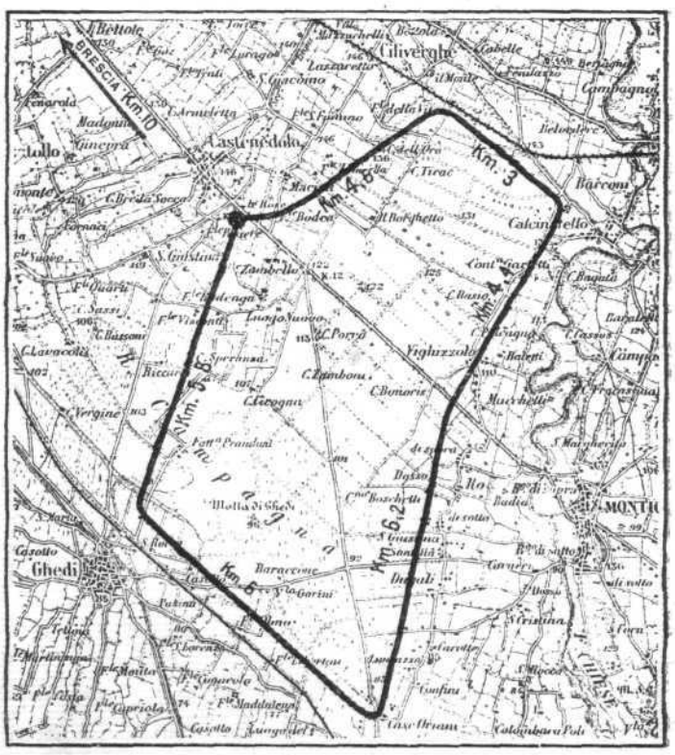
COUNT HENRY DE LA VAULX, acting on behalf of an anonymous person, has placed at the disposal of the Aero Club of France a sum of 10,000 francs for the creation of a single prize under the title of Prix de la Commission Sportive de l'Aero Club de France. The Competition is to take place under F.A.I. rules, and is open under certain conditions to all types of flying machines, and also to dirigibles not exceeding 1,200 cubic metres capacity. Briefly explained, the event will consist of accomplishing a specified course not exceeding 170 kiloms. on a specified day, but the precise details are not yet published.

Prize for a Book on Flight.

THE prize of £1,000 offered by King Leopold of Belgium will be awarded this year for the best treatise on aerial navigation.

Brescia Circuit.

MATTERS are progressing in respect to the proposed aeronautic meeting at Brescia, which is to take place in September of this year, and an influential committee has been formed. The events, for which 100,000 francs will be set aside as prize money, will comprise as the most important detail a trial over a distance of 150 kiloms. This will consist of making five laps of a circuit, over a great plain which is 10 kiloms. wide and 8 kiloms. long, and is encumbered by neither villages, trees, nor other obstacles. It has already been specified that the medium height at which flights will be considered to be eligible for the competition is 10 metres above the ground. Attempts may be made on any day, and at any time during the month that the event is open. A prize will be awarded to those who have shown the best results over the specified course, and it is intended to be generous in the matter of consolation prizes.



The Brescia "Circuit" which has been selected for the big flight meeting to be held in this district during the present year.

New Rules for Trial Flights.

THE Aviation Committee of the Aero Club of France has just issued certain rules to be observed in connection with official flights to take place under their observation. The first rule relates to the marking of the course, and the second to its method of measurement. It is further specified that the only recognised records in flight are (1) records of distance, and (2) records of duration. Specified distances and durations are mentioned which will alone be recognised, and flights in which there is a descent will be placed in a different category to those in which the aeroplane is aloft all the time.

In effecting a flight, should an aviator touch one of the marks with his machine, he will have to make a complete circle of the post before continuing.

In making measurements, distances up to 5 kiloms. must be measured direct. Distances between 5 and 50 kiloms. must be measured on an ordinance map having a scale of 1 : 80,000. Distances above 50 kiloms. will be considered as equivalent to the length of the arc on the surface of a globe, neglecting variations of altitude.

The recognised distances over which records may be timed are as follows: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1,000, 1,500, &c., kiloms. Increments to be in units of 500 kiloms. for distances above 1,000 kiloms.

Records for duration will be allowed as follows: ½, 1, 2, 3, 4, 5, 6, 10 and 24 hours. Durations above 24 hours to be by multiples of 24 hours. In both distance and duration records, the Aero Club will recognise the number of passengers carried.

Gross Airship No. 3.

ANOTHER Gross airship is being constructed in Germany, and will be larger than its predecessor, besides having many important modifications based on previous experience.

Four Zeppelins for the German Navy.

FOUR Zeppelin airships have, it is stated, been ordered for the German Navy, and the Admiralty has been instructed to prepare floating docks for them. They will be built under the personal superintendence of Count Zeppelin, and will have a capacity of from 12,000 to 14,000 cubic metres each. They will cost about £50,000 each, and are intended more for use as scouts than as aggressive ships of war. Two are to be stationed at Wilhelmshafen, and two at Kiel.

Capt. Hildebrandt's Airship.

CAPT. HILDEBRANDT, who published some little while ago a book on "Airships, Past and Present," has just bought a dirigible from Messrs. Baldwin, the well-known American aeronauts. The airship was tried at Hammondsport, and is capable of remaining aloft for 5 hours; it is quite a small machine.

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CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

PROGRESS IN FLIGHT.

To the Editor of FLIGHT.

SIR,—I shall be very pleased if you will forward to me the first copy of FLIGHT, together with a subscription form.

I was much interested in Mr. Moore-Brabazon's letter in *The Automotor Journal* of January 2nd. It is a standing rebuke to Englishmen that he can advise—and with good reason—any experimenters to go to France. In Paris one feels the beating pulse of a new era. It causes no surprise if, on looking up, one sees a "direagable" performing graceful evolutions; picture postcards of all the aeroplanes command a ready sale; aeroplanes in flight forms one of the chief advertisements for many of the cinematograph entertainments; and on the evening following Wilbur Wright's sensational high flying in connection with the "Height Prize," I saw it reproduced on the cinematograph at a lecture given by the Comte de la Vaulx on the "Conquête de l'Air." The humble enthusiast is not regarded as an "amiable lunatic" in France.

I was in Paris for a little over three months recently, and, not being blessed with too much time or money, I had to wait for an opportunity to visit Le Mans. At last it came—October 31st; a friend was going to Le Mans on his car. I was doomed to some degree of disappointment. A new carburettor float caused trouble by not being a free fit on the spindle; a tyre punctured, and an exhaust-valve spring broke; with the result that we arrived at Auvours just as Mr. Wright finished his flight for the day. To add to our disappointment, we had come *via* Chartres, and had also missed M. Bleriot's cross-country flight near that town.

I am afraid that I have trespassed on your valuable time, but I must wish you every success with your new venture, FLIGHT, and hope that it will do something to "wake up England."

I remain, Sir, yours faithfully,

Bristol, January 1st. G. H. CHALLENGER.

To the Editor of FLIGHT.

SIR,—In your last issue you publish a letter from Mr. Moore-Brabazon; with the views therein expressed I must entirely disagree.

If those who have enthusiasm in the direction of flight are to leave for France, how is English enthusiasm to be generated?

No one denies the apathy that exists here, but surely it is against the tradition of our race to dismount at the first ditch and attend the finish in a foreign car.

What of Voisin? I ordered some propellers fifty days ago for my flying machine. These were promised in eight days, but no doubt with the great facilities (?) and the vast experience of this well-known firm, we shall probably receive them before eight months have elapsed.

Even in this retrograde and old-fashioned country, I have no doubt I could have built and delivered within eight weeks of accepting the order any aeroplane that was not more complicated than either Wright's or Voisin's (Farman's).

Moreover, that the machine would be English-built throughout, and would compare favourably with other machines both for price, finish, and weight.

One must, however, admire the efforts that our French friends have made, and also we are bound to envy them the support they receive.

The views here expressed in no way lessen my enthusiasm for the efforts Mr. Moore-Brabazon has made; I only wish he would translate them into English.

Yours faithfully,

Brook Street, Grosvenor Square, Jan. 4th. JACK HUMPHRY.

A WANT—AN ENGINE FOR MODELS.

To the Editor of FLIGHT.

SIR,—It was with much pleasure that I welcomed the issue of FLIGHT, as an independent journal, devoted to the science of aviation, and I would add my small effort to what, I know, will be a very torrent of applause.

The fact that you have expressed your willingness to throw open your correspondence columns, I give as my excuse for troubling you in what, at first sight, may seem a minor point.

Many of us, however, who are engaged in the construction of model flying machines are met with a real difficulty in the matter of engines with which to drive them.

The majority of small petrol motors—say up to 1½-h.p.—are far too heavy and inefficient to be of much use for experimental flights, and most other types are quite out of the question.

If you could see your way to giving this matter your attention, you would be conferring a great boon on a large army of really serious workers.

It is also quite possible that some enterprising manufacturer is only waiting for the hint to design a small engine for this special purpose.

Yours faithfully,

E. B. ELDRIDGE.

Oxford, January 5th.

THE AERO CLUB OF THE UNITED KINGDOM.

To the
Members of the Aero Club of the United Kingdom.

166, PICCADILLY, LONDON, W.,
January 6th, 1909.

DEAR SIR, OR MADAM,

Official Notices.

I am instructed by my Committee to inform you that from the commencement of the year 1909, an Official Organ of the Aero Club of the United Kingdom, entitled "FLIGHT," will be sent out weekly to all members of the Club free of charge.

The attention of members is particularly directed to the column headed "Aero Club of the United Kingdom," *wherein all notices and announcements affecting the Club will appear from time to time, instead of being communicated by circular as heretofore.*

Lecture.

M. Robert Esnault-Pelterie, of Paris, has promised to deliver a lecture on Aviation, with cinematograph illustrations, on Tuesday, January 12th, 1909, at 4.30 p.m.

The Committee of the Royal Automobile Club have kindly placed their premises, 119, Piccadilly, London, W., at the disposal of the Aero Club for this occasion. Members of the Aero Club, who are not members of the Royal Automobile Club, wishing to attend, are requested to apply to me for tickets of admission not later than Saturday, the 9th inst.

Yours faithfully,
HAROLD E. PERRIN,
Secretary.

THE AERO CLUB OF THE UNITED KINGDOM.

(*Officially communicated by the Secretary.*)

THE following new members have been elected to the Aero Club this year :—

Frank P. Armstrong.
Bertram Blount.
Mrs. Hart O. Berg.
W. H. Buxton.
Henry Birnbaum.
A. E. Berriman.
Capt. Hon. Dudley Carleton, J.P.
Serge Vincent de Bolotoff.
F. G. Freeman.
William Graham, J.P.
C. Graham.
Rev. R. V. Greene.
Sir William Goff, Bart.
H. Jacques.
Col. H. S. Massy, C.B.
Mrs. H. S. Massy.
Capt. E. M. Maitland.
Anthony G. New.
Mervyn O'Gorman.
Capt. A. G. Ritchie.
Noel W. Richardson.
Somers Somerset, J.P.
Marquis de Mouzilly St. Mars.
H. Gordon Selfridge.
Major H. F. Trippel.
Clarens Tweedale.
Count Wrangel.
Philip Waterhouse.

Medal of the Aero Club of the U.K.

Federation Aeronautique Internationale.

The meeting of the Federation Aeronautique Internationale will take place at the Hotel Ritz, London, W., commencing on Monday, January 11th, 1909. The following delegates have been appointed to represent the Aero Club of the United Kingdom :—

Ernest C. Bucknall.
Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O.
Col. J. E. Capper, C.B., R.E.
Martin Dale.
Prof. A. K. Huntington.
V. Ker-Seymer.
C. F. Pollock.
Hon. C. S. Rolls.
Viscount Royston.
Roger W. Wallace, K.C.

Delegates from the following countries are expected to attend :—France, Germany, Switzerland, Sweden, Italy, Spain, America, and Austria.

The appeal of the Aero Club of the United Kingdom against the award in the Gordon-Bennett Long-Distance Balloon Race will be heard at the conference. Regulations for International competitions for "Heavier-than-Air" machines will also be considered.

The hospitality of the Royal Automobile Club will be extended to the foreign delegates attending the conference.

Northcliffe Cup.

The Northcliffe Cup has been awarded to Mr. John Dunville, who accomplished the longest balloon journey during the year 1908. On December 11th Mr. John Dunville, accompanied by Mr. C. F. Pollock and Mr. Philip Gardner, started from the Chelsea Gas Works and descended at Crailsheim, in Germany, a distance of 480 miles.

Svenska Aeronautiska Sallskapet.

The members of the Aero Club have been invited to take part in the balloon competitions to be held in conjunction with the Northern Games, at Stockholm, on February 16th and 17th. Members wishing for further particulars are requested to communicate with the Secretary, at 166, Piccadilly, W.

£500 Cross-Channel Prize for Flying Machines.

M. Ruinart has offered a prize of £500 for a Cross-Channel flight, open till January 1st, 1910. The rules have been received for the consideration of the Aero Club of the United Kingdom, and will be issued shortly.

HAROLD E. PERRIN,
Secretary.

For Particulars and Advantages of the Aero Club League see page iii (cover).

Flight

THE WRIGHT AND VOISIN TYPES OF FLYING MACHINE.*

A COMPARISON BY F. W. LANCHESTER.

(*Concluded from page* 16.)

IT would thus appear that in addition to being considerably less efficient in its screw propeller (a tax paid for the constructional advantage of a direct drive), the Voisin machine is also slightly less efficient considered as a glider, that is to say, its gliding angle is not quite as good as that of the Wright machine; the machine is *aerodynamically* less efficient.

The reason of this may be due to the fact that it has a less aspect ratio, but it may quite well also be due to many other causes; the Voisin machine has relatively greater idle surface subject to skin friction, also the sustaining surfaces of the tail act on air that has already been trodden by the aerofoil.

The author is not altogether satisfied that the gliding angle is actually as low as that deduced above; it is possible that the motors with the machines at the velocity stated in both cases run somewhat faster than that declared, and that consequently the pitch of the propellers is proportionately less, since this has been deduced from the revolution speed. An error of this kind, so long as it is much the same for both machines, would not materially affect the results except that in both cases the gliding angle would be proportionately greater, the error may possibly amount to a matter of about 10 per cent.

It is also worth while noting that what is termed the mean or actual pitch of the propeller blades will be greater than the effective pitch; the pitch as measured from the blade angle is probably in the Wright propeller about 15 per cent. more than the effective pitch, and in the Voisin about 25 per cent. On this basis the Voisin 3·6 ft. becomes 4·5 ft. (= 1·37 metres), and the Wright 9·6 ft. becomes 11 ft. (= 3·35 metres).

Taking the gliding gradient tan γ for the Wright machine as ·135, and that of the Voisin machine ·150, values which the author considers most probably a close approximation to the truth, we may roughly look upon the resistance as accounted for as follows:—

	Wright.	Voisin.
Skin friction, ξ = ·01	40 lbs.	60 lbs.
Struts and wires	30 ,,	20 ,,
Aeronaut, motor, &c.	20 ,,	10 ,,
Radiator and tanks	5 ,,	25 ,,
Alighting gear	— ,,	10 ,,
Sustentation (power expended aerodynamically)...	60 ,,	100 ,,
	155 ,,	225 ,,

The above do not correspond exactly with the suggested values of tan γ, but they are as near as the author can estimate at present. The addition in the case of the Wright machine is a trifle high, and that of the Voisin is a little low. Possibly the fault is with suggested values themselves, and there is really less difference between the gliding angles than has been supposed.

In conversation with the author, Mr. Wilbur Wright has stated that he makes no allowance for skin friction and that he believes it to be negligible. There is evidently considerable scope yet for guess-work. It is quite likely the designers themselves could not give a much better approximate balance-sheet of the resistance account than that here presented. It is possible that the co-efficient of skin friction ξ is less than ·01; for these large surfaces and high velocities it is conceivably no more than half this value. It is equally possible that the other direct resistances, struts, wires, &c., have been underestimated, there may also be faults of as much as 10 or 15 per cent. in the estimate of the energy expended in sustentation, but it is quite certain that skin friction is not negligible but that it is a substantial quantity of the order indicated, it is also quite certain that the gliding angle of the machines is round about the values given 1:6 to 1:8, and is nowhere near 1:12 as has been stated in a recent paper on the subject; it is also improbable that the efficiency of propulsion is in any case as high as 75 per cent. as it has sometimes been represented (in the case of the Wright machine) although it may in both cases be a few per cent. greater than given in the present paper.

On the whole the advantage certainly rests with the Wright machine from the aerodynamic standpoint.

Stability.—We now pass on to consider the question of stability and control.

(A) Longitudinal stability.

In the case of the Wright machine it is claimed by Mr. Wright himself that the stability depends entirely on the skill and address of the aeronaut; in fact, if we are to credit the unchallenged account of Mr. Wright's declaration on the subject, he does not believe in the possibility of safety, under ordinary weather conditions, being achieved by the inherent properties of the machine. He says that sooner or later the fatal puff must come that will end the flight.

The author's own observations on the flight of the Wright machine fully confirm the statement that *Mr. Wright does depend entirely upon his manipulative skill.* It appears that in flight the leading plane travels through the air, carrying little or no load; in the ordinary conditions of straight flight their direction is as nearly as can be estimated parallel to the frame of the main aerofoil, and both seem to move almost exactly edgeways. It follows from this that the machine cannot be automatically stable, for if the plane were *fixed* for any period of time, and if during that period the machine made the smallest pitching movement either one way or the other, the resulting change of pressure on the leading plane (or planes) would tend to exaggerate the initial movement, and the machine would turn over. The position of the machine with the leading planes fixed is comparable to an arrow travelling feather first, and this condition is one of instability.

In brief, not only does Mr. Wright design definitely for hand-controlled equilibrium, but he has no belief in the possibiliy of making a machine safe by its own inherent stability. The sutccess of the Wright method shows that *there is at least more than one way to fly.*

In the Voisin machine, on the contrary, it has been the intention of the designer that the machine should be automatically and inherently stable, and unquestionably to a great extent he has succeeded. The author is at present compelled to speak with some reserve as to the degree of success that MM. Voisin have achieved; they have promised to supply particulars that will enable the point to be investigated, but up to the time of writing this promise has not been redeemed. In the meantime it may be remarked that the disposition of the organs of the Voisin machine is such as will give automatic stability if the following conditions are fulfilled:—(1) If the pressure is less (per sq. ft.) on the tail than on the main aerofoil so that the *attitude* of the aerodrome to its line of flight is one of stable equilibrium; (2) if the areas and disposition of the surfaces, the amount of inertia, the velocity of flight, and the natural gliding angle, are related to comply with the *equation of stability*† so that any oscillation in the vertical plane of flight will not tend to an increase of amplitude.

From the behaviour of the machine it is not possible to tell whether these conditions are complied with, because it is fitted with a horizontal rudder in front, by which the aeronaut can correct any departure from the straight line, and this appliance is unquestionably utilised to destroy any oscillation that would otherwise arise; it is a big rudder, about one-quarter the area of the aerofoil, and skilfully handled it would entirely mask the natural free oscillation period of the machine. From observation of the flight, the author is of opinion that whether or no the machine has inherent stability or not, the actual fact is that its motion (in the sense under discussion) is just as much hand-controlled as the Wright machine. In the hands of a beginner the machine would, however, very likely be able to take care of the aeronaut to some extent, performing oscillations the while, until the aeronaut has learned to take care of the machine; this view is suggested by the fact that many of the observers who saw Farman and Delagrange early in their career witnessed the phugoid oscillation, whereas the author, who saw Farman only a few weeks back, could not detect any oscillation at all, except for a brief period after he first left the ground, and this in spite of the fact that the day was by no means calm—a very perceptible breeze was blowing.

M. Colliex, engineer to MM. Voisin, claims that the flight path of their machine is stable on the following grounds:—

(1) A one-tenth scale model showed itself quite stable in gliding flight.

(2) A machine mounted by Delagrange made a smooth glide to earth without the intervention of the aeronaut in any way when the ignition was cut off at 8 metres altitude.

The first of these tests would be quite satisfactory if due precautions are taken to ensure that the model test is made under the conditions of corresponding speed. As a matter of fact, the velocity of the model was nearly half that of the full-sized machine, instead of slightly less than one-third, as it should have been. In conse-

* A paper read before the Aeronautical Society of Great Britain, December 8th, 1908.

† "Aerial Flight," Vol. II, Aerodonetics, Chap. V and VI.

quence, it follows from the equation that its factor of stability was about three times that of the full scale machine, so that the experiment cannot be considered conclusive. The evidence of the flight of the actual machine in the hands of Delagrange also is insufficient, for the horizontal distance that the machine would glide from a height of 8 metres altitude would be approximately 55 metres, and this is little more than one quarter of a phase length. For this test to be considered satisfactory, the machine should be allowed some four or five free oscillations, and the phase length being about 600 ft., this involves a flight path of about 3,000 ft. length, or a fall of about 500 ft., that is, 150 metres. There is thus no proof at present forthcoming as to the stability or otherwise of the flight path of the Voisin machine, but it is at least the intention of the makers that it should be longitudinally stable, and, from conversations that the author has had with MM. Voisin, and with their engineer, M. Colliex, they appear to be alive to many of the points that conduce to such stability.

(B) *Lateral Stability.*—In the Wright machine the lateral stability is under the direct control of the aeronaut, the "two wings" of the aerofoil being given a twist by straining the structure by means of wires arranged diagonally in the rear panels of the two end bays on either hand. This causes the wings to meet the air at different angles of incidence, and so any desired turning moment about the axis of flight (within certain limits) is at command. This mechanism is employed to neutralise the influeuce of wind gusts, and to correct the position of the machine should it acquire an undesirable list. It is also utilised to prevent the machine canting too much when turning, and to facilitate its employment in this respect, the rudder aft and the twisting of the wings are operated by one lever, the motion to the right and left being utilised to put tension on the diagonal wires one way or the other, and the movement forward and backward works the rudder.

It is desirable to correct a false impression that is current on the action of the wing-twist. It has been supposed by some that it is used *to give the cant* required by the machine when turning, but such is not the case. If the rudder is used, the machine almost immediately gets a cant owing to the greater pressure on the wing that in turning is moving faster through the air, and this cant becomes, if unchecked, far too severe. The twist is then used to check the cant, the wing on the outer circle (that is, farthest from the centre of curvature), being "feathered," the inner one having its angle of incidence increased.*

In the Voisin machine no hand-adjustment is provided to enable the aeronaut to control the lateral stability, hence in this case it is definitely automatic. The Voisin machine is steered by means of a vertical rudder arranged between the fixed tail members, and there is apparently no special mechanism to prevent the over canting; consequently Farman, in his flights, commonly turns in a leisurely manner, employing a circle of considerable radius, whereas Wright may often be seen to perform sensational evolutions, turning with his wings canted to nearly 30 degs. on a radius of perhaps not more than 60 or 70 yards. Farman has recently had fitted to his machine some adjustable flaps, to give, in effect, the wing-twist employed by Wright. Presumably this is to facilitate turning, for the flight of the machine does not suggest that they are otherwise wanted. Under other circumstances the lateral stability leaves little to be desired.

Summarising the comparison, from the aerodonetic standpoint, the author is inclined to think that the Voisin machine has the advantage, as containing more of the features that will be embodied in the flying machine of the future. Mr. Wright's contention that it only requires a big enough puff of wind to upset a machine that depends upon its own inherent stability is certainly true, but probably the same is equally true of the hand-controlled machine. There is a limit to the extent of the control that can be exercised, and with hand control we have, too, the possible failure of the human machine. The fact is that the secret of stability is contained in the one word *velocity*, and until it is possible to attain higher speeds of flight, we cannot hope to see the flying machine in everyday use.

There is one other point of comparison, that if space permitted the author would like to make. As it is a few words must suffice.

The constructional methods employed by Wright and Voisin present a striking contrast. The Wright machine is astonishing in its simplicity—not to say apparent crudity of detail—it is almost a matter of surprise that it holds together. The Voisin machine has at least some pretensions to be considered an engineering job.

Mr. Wright defends his methods by asking what would be said by an engineer to the rigging of a sailing vessel if shown it for the first time, and to some extent the analogy is a good reply to the objection; still the author feels (perhaps wrongly) that there is a considerable amount of the Wright "mechanical detail" that might be revised with advantage, at least before the machine is placed in the hands of the private user. However, "the proof of the pudding is in the eating," and in spite of the rudimentary character and aggressive simplicity of the constructional detail of the Wright machine, it appears not to come to pieces, but continues to fly day after day without showing any signs of weakness or disintegration.

On the question of the motor and transmission mechanism we tread on difficult ground, for the Voisin system of metal propeller keyed direct to the crank-shaft is so immeasurably superior, from the purely *mechanical standpoint*, to the chain-drive and wooden propellers of Wright that comparison is unnecessary. Since, however, the simple and direct arrangement adopted by MM. Voisin is paid for at the price of about a 15 per cent. tax on the transmitted horse-power, the question is evidently one of the balance of advantages and disadvantages that are of entirely different kinds. The author has reasons for supposing that if in the machine of the future the geared propeller survives (for it is essentially the use of *gearing* in the Wright machine that permits the better proportions of propeller to be used) it will be in the form of a propeller or propellers centrally situated, thus resembling the Voisin arrangement, rather than in the distribution of propellers such as at present employed by the Brothers Wright. The simplicity of the direct-drive may, however, alone be sufficient to outweigh any economic advantages that gearing may possess. I personally consider the Wright disposition of propellers to be a source of danger. If a torque is applied to an aerodrome about a vertical axis, rotation about this axis at once begins, and the outer wing travelling through the air faster than the inner experiences a greater lifting reaction, and if the torque is sufficient, the machine is very soon (in nautical phraseology) on its "beam-ends." It is evident that if one of the propellers fail from the fracture of a chain or other cause, unless the motor be instantly stopped, the whole power of the motor, and therefore the whole thrust, will be transmitted through the other propeller, causing a torque about a vertical axis that must be overwhelming. If the motor is promptly stopped then much will depend whether the propeller that has failed is scotched or free. If it has jambed then it will probably balance by its drag the other propeller, which is either stopped also or is driving the motor against its internal friction; if, on the contrary, it is free, then the drag of the other propeller will be unbalanced, and there is a serious torque in the opposite sense to that which would have existed if the motor had still been running. Whether Mr. Wright can, in the latter case, by wing-twisting and other contortions, save himself from destruction I do not know. It is said (*vide* Press a short time ago) that a chain actually broke in flight and the machine safely landed; the altitude when the accident occurred was stated to be only 4 or 5 metres, so that Mr. Wright did not have a fair chance of exhibiting his resources. It is to be hoped that he will not have such a mishap at a higher altitude.

* A certain patentee sent the author a specification of his invention in which a rudder was carefully arranged to act spirally, to give a cant in the direction of the banking, that is, the direction in which the turning moment is already excessive. He might be well advised to take out another patent for the same device, arranged to act in exactly the opposite way.

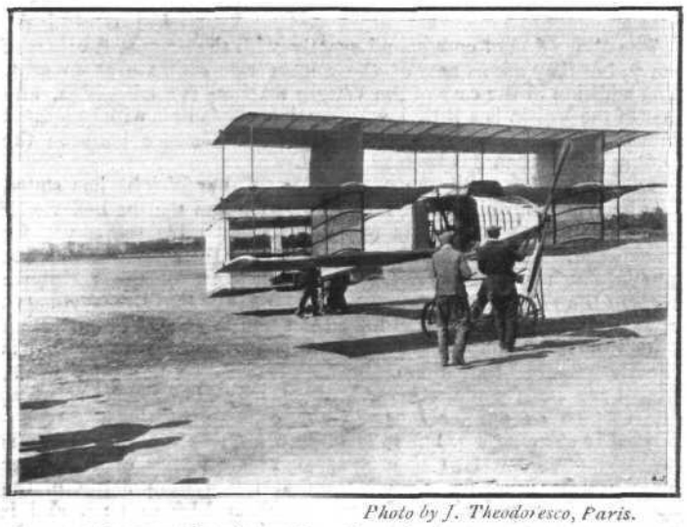

Photo by J. Theodoresco, Paris.

Goupy Triplane, fitted with Anzani motor.

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Aeroplanes, Ltd.—Capital £100, in £1 shares. Formed to manufacture, let on hire, and otherwise deal in acroplanes, flying machines, balloons, &c., whether propelled by petrol, steam, gas, or other motive power.

BOOKS RECEIVED.—*Artificial and Natural Flight.* By Sir Hiram Maxim. London: Whittaker and Co. Price 5s. net.

Aeronautical Patents—Applied for in 1909.

Published January 7th, 1909.

7,370. J. SAWARD. Airship.